Investigating the Acclimatization to Light and Water Stress in Three Strains of *Arabidopsis thaliana*

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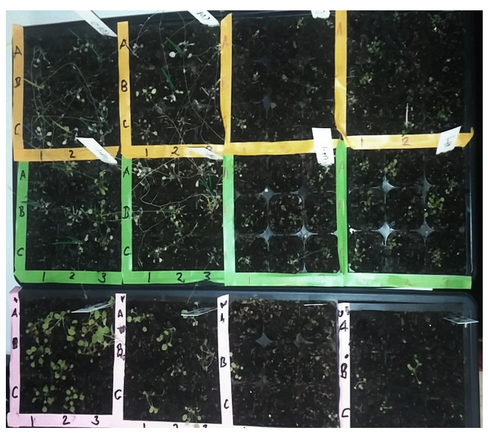
Introduction

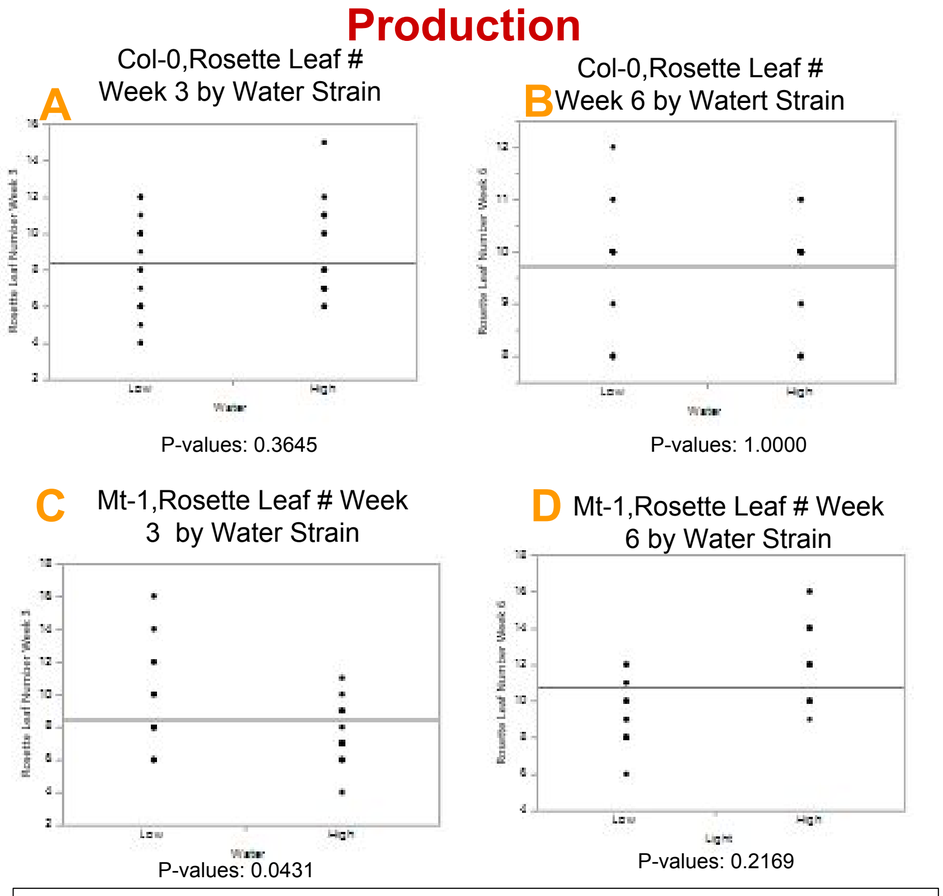
The transition from vegetative to reproductive growth represents a crucial change in a plant's lifecycle and many plants have evolved various endogenous mechanisms for interpreting environmental input in order to initiate this transition optimally. In this experiment three different strains of *Arabidopsis thaliana* were grown under treatments of high and low light intensity and water availability. A commonly used wild type strain, Columbia (Columbia, Missouri, United States, Col-0), a North African ecotype, Martuba (Martuba, Libya, Mt-1), and a European ecotype, Basel (Basel, Switzerland, Bs-5) were monitored over six weeks for changes in rosette diameter, rosette leaf number, and appearance of inflorescence. We hypothesize that Mt-1, due to its origin from an equatorial climate; will be better equipped to deal with high light and low water conditions.

Methods

Col-0 high water high light	Col-0 high water low light	Col-0 low water high light	Col-0 low water low light
Mt-0 high water high light	Mt-0 high water low light	Mt-0 low water high light	Mt-0 low water low light
BS-5 high water high light	BS-5 high water low light	BS-5 low water high light	BS-5 low water low light

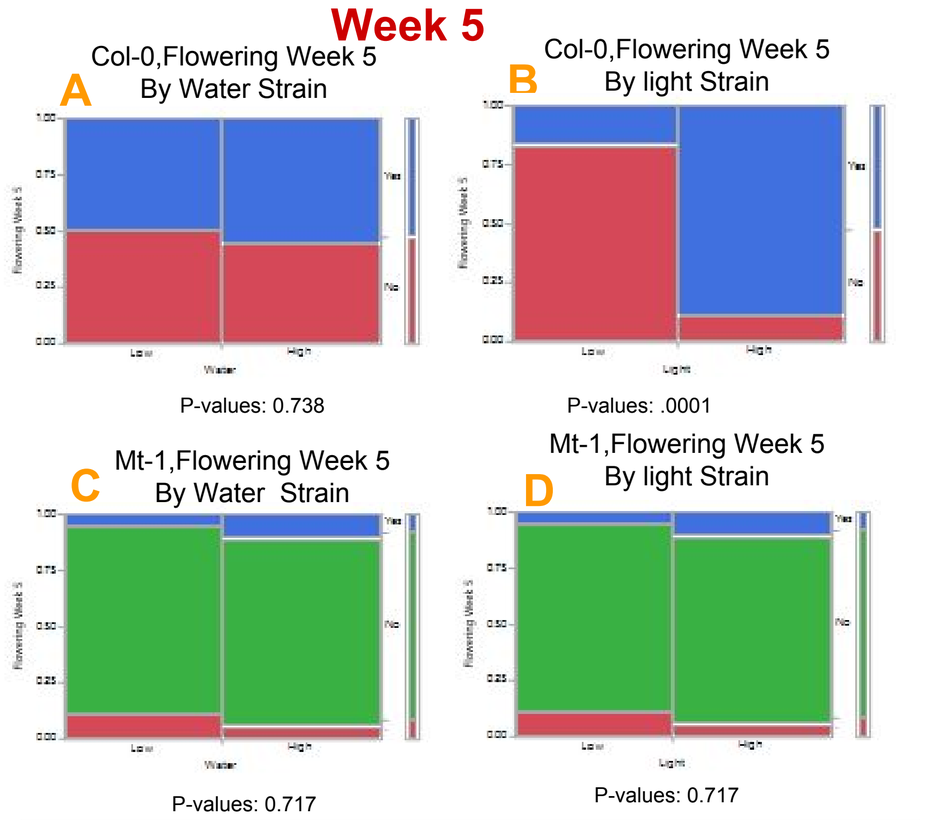


Water availability is Less significant for Leaf Production



(A) Quantification of rosette leaf numbers at week 3 for Col-0 grown under high and low water. No significant difference observed in either week 3 or week 6 (B). Week 3 shows a significant difference in leaf number in the Mt-1 strain (C) but not in week 6 (D).

Col-0 Flowers More Under High Light in Week 5



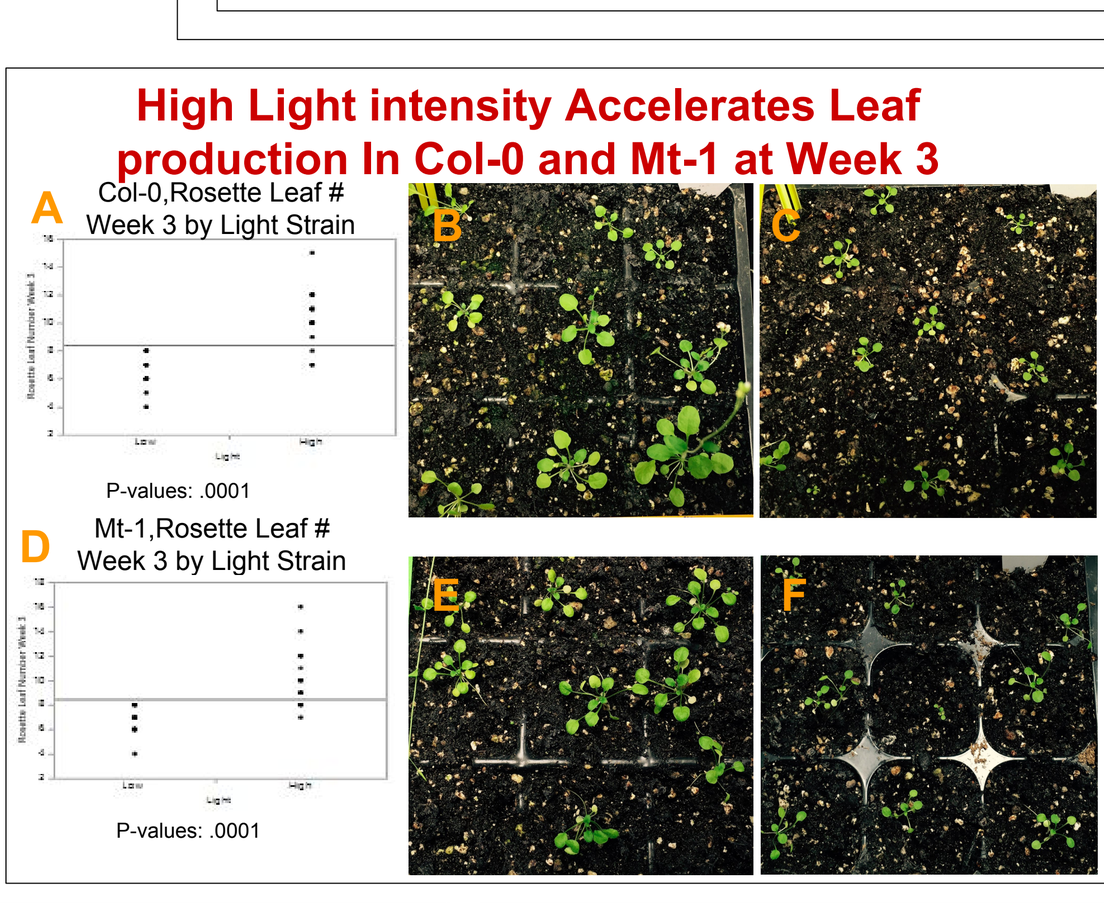
(A) Water availability does not demonstrate a significant effect on flowering in Col-0. (B) Col-0 plants grown under high light produce significantly more flowers than those grown under low light by week 5. No significant difference in inflorescence observed in Mt-1 plants for variation in water availability (C) or light intensity (D) in week 5.

High Light intensity Accelerates Leaf production In Col-0 and Mt-1 at Week 3

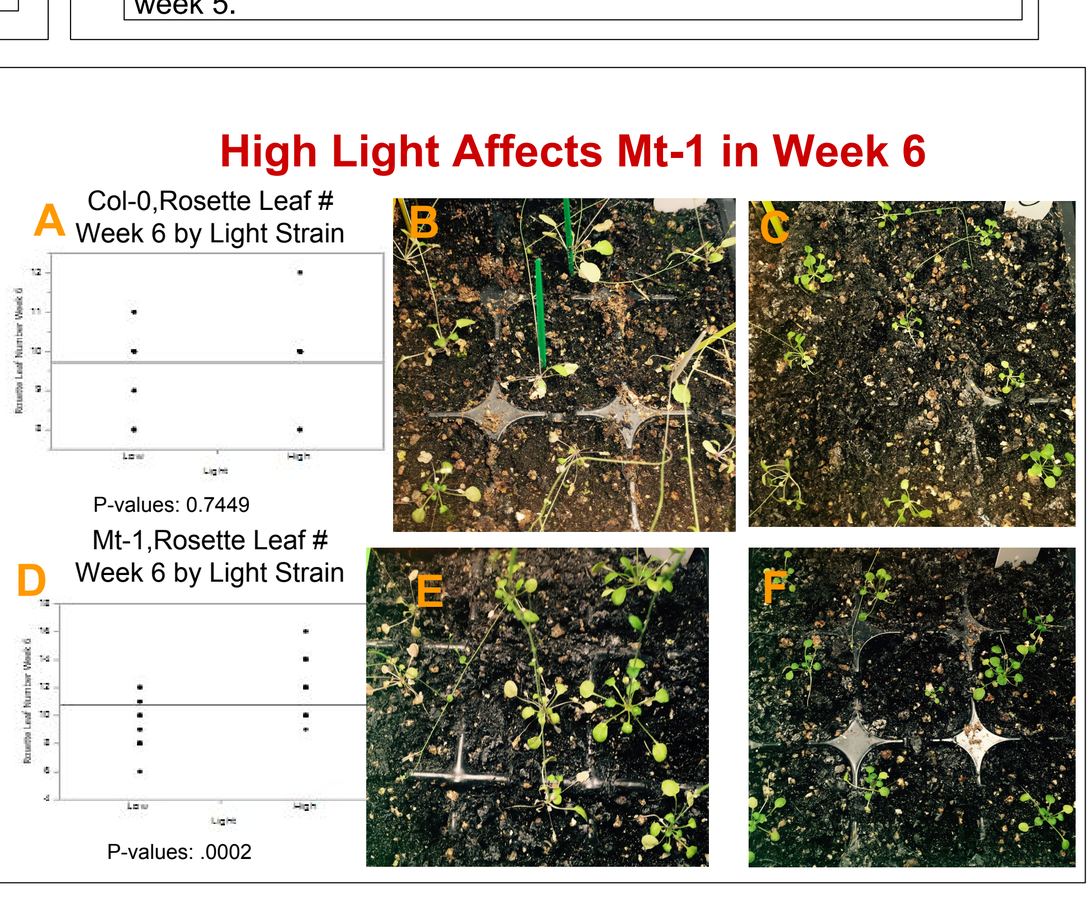
(A)Quantification of leaf number at week three in Col-0 and Mt-1 (D) grown in high and low light intensities. (B) Col-0 grown under high light developed more leaves than under low light (C). Mt-1 plants demonstrate a similar phenotype under high light (E) and low light (F).

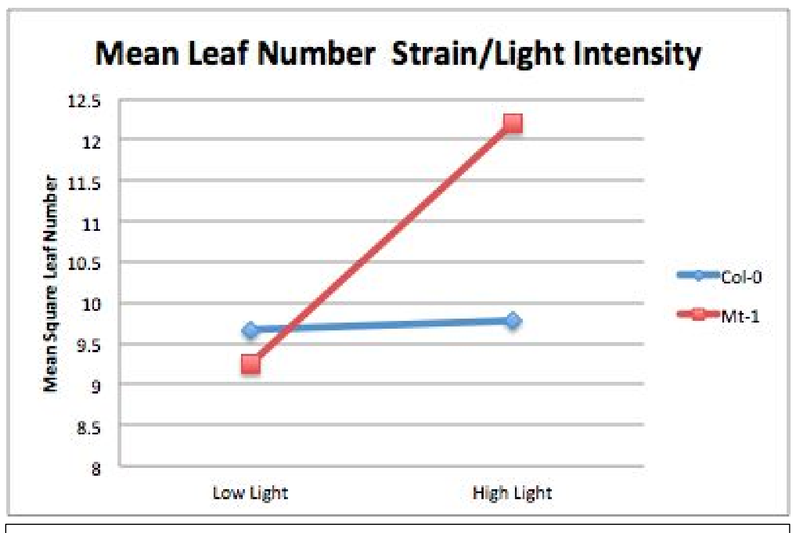
High Light Affects Mt-1 in Week 6

(A) Week six does not show a significant change in leafs number in Col-0 between high light (B) and low light (C). (D)Mt-1 plants continue to produce more leaves into week 6 under high light (E) than in low light (F).



High Light Affects Mt-1 in Week 6





The mean leaf number of both strains grown under high and low light intensity. Longer vegetative growth period may be favored by the Mt-1 ecotype grown und high light.

Discussion

The results presented indicate an increased vegetative growth period of the Mt-1 strain under high light intensity compared to two other strains. In this experiment, high light intensity overall decreased the vegetative growth period and initiated reproductive growth (flowering) more rapidly than plants grown under low light conditions both within a single strain and also between strains. Mt-1 plants developed more leaves when grown under high light however, water was a less significant factor overall and only caused a significant change in rosette leaf number in the Mt-1 strain during week 3. Taken together, our results suggest that the Mt-1 strain may possess endogenous mechanisms that enable it to take advantage of increases in energy from light and grow more robustly.

Conclusion

- Light intensity can alter the life cycle of plants.
- Mt-1 plants may have mechanisms to utilize higher levels of irradiance more efficiently.

Acknowledgements

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References

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